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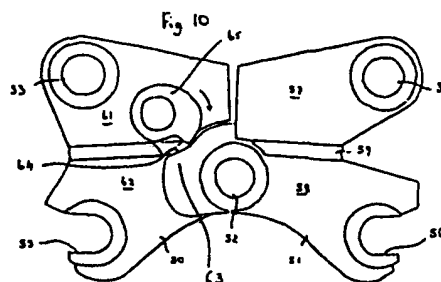
(71) Applicant: Jones, Paul Owen
 40A Smithfield Road
 St. Johns Park New South Wales 2176(AU)

(72) Inventor: Jones, Paul Owen
 40A Smithfield Road
 St. Johns Park New South Wales 2176(AU)

(74) Representative: Howden, Christopher Andrew et al,
 FORRESTER & BOEHMERT Widenmayerstrasse 4/1
 D-8000 München 22(DE)

(54) A quick-release hitch.

(57) A hitch for attaching an implement to the arm of a hydraulic excavator comprises a pair of pivoted links (50, 51), each link having a jaw (55, 56) for engaging a pin (8, 9) on the implement; the links can be jack-knifed to engage or disengage the implement; and locking means are provided for locking the links together when the implement has been engaged. Preferably, the locking means is a rotatable cam (65) and/or over-centre mechanism.



A quick-release hitch.

The present invention relates to a quick-release hitch for attachment to the arm of an excavator. The hitch allows implements to be changed automatically by the driver of the excavator without the driver having
5 to leave his control cab.

Australian patent specification No. 18602/83 describes a quick release hydraulic hitch which fits between the arm of a conventional excavator and a conventional implement, so that no modification of either
10 the excavator or the implement is required. A number of embodiments are described and in each case the implement is attached to the hitch by means of a hydraulic mechanism. The hydraulic mechanism is required
15 to be pressurised in order safely to retain the implement.

A potential disadvantage of this known system is that accidental leakage of fluid from the hydraulic
20 mechanism can cause the implement to become detached, with dangerous consequences.

It is an object of the present invention to provide a hitch having a mechanical or semi-mechanical locking
25 system, whereby once the implement has been attached, it is possible to deactivate the hydraulic system (or other engaging system) without the implement becoming

detached.

In the present specification, the term "excavator" will be understood to have a wide meaning covering
5 all machines, hydraulic or otherwise, having an implement mounted at the end of an arm, and therefore includes not only hydraulic excavators as such but also backhoes.

A wide variety of implements may be used with
10 the hydraulic excavator, for example the implement might be a bucket, auger, drill, tamper, a ripping-tooth, a hydraulic drill, a grader blade, or any of the other commercially available implements. Each
15 implement will be provided with pin holes to enable it to be attached to the dipper and to the tipping links of the excavator. Such implements are conventionally provided with a pair of pins extending through the pin holes and the hitch of the present invention
20 is designed to co-operate with these pins, without requiring any permanent modifications.

The present invention provides a quick-release hitch for attachment to the arm of an excavator, the hitch being adapted to pick up and retain an implement
25 provided with a pair of parallel transversely extending spaced pins; which hitch comprises: a first and a second longitudinally extending link, first ends of the links being pivotally connected together, and a second free end of each link having a jaw for embracing
30 a respective implement pin; locking means for locking the links together against relative pivotal movement when an implement has been engaged by the hitch; and attachment means for attaching the hitch to the excavator arm.

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The locking means may be a locking pin passing through apertures in the links, a sliding tongue on

one link slidable into the other link, or other known locking means. Advantageously, the locking means comprises a rotatable cam element on one link which engages a ramp surface on the other link, thereby
5 allowing locking together of the links in a range of pivotal positions with respect to each other.

Alternatively or additionally, the locking means may comprise an over-centre locking mechanism. The
10 term "over-centre mechanism" will be understood to mean a mechanism wherein the pivotal connection of the links in the engaged position is over-centre, either with respect to a line joining attachment points (of the attachment means) where the dipper and tipping
15 link are attached to the hitch (giving partial locking); or also over-centre with respect to the jaws of the hitch (giving complete locking).

In a simple embodiment, the links are thrown
20 over-centre by gravity due to the weight of the locking mechanism, or by manipulation of the excavator arm, to capture the implement.

However, a drive means may be provided for pivoting
25 the links. The drive means may be a hydraulic motor, hydraulic ram or an equivalent electrically or mechanically operated mechanism. Usually, the drive means is arranged at least to disengage the hitch by jack-knifing the links. This reduces the distance
30 between the jaws and disengages the hitch from the implement pins.

Means may also be provided for sliding the links longitudinally relatively to one another, so as to
35 allow for slight variations in pin spacing. This may be done using an eccentric shaft running freely through one link and journalled into the second link. The

shaft is operated by a motor secured to said one link.

The jaws of the hitch may face towards or away from each other for engaging the implement pins from
5 the outside or inside, respectively.

Embodiments of the present invention will now be described, by way of example only, with reference to the drawings, wherein:

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FIGURE 1 is a side elevation of the end of an excavator arm carrying a hitch according to a first embodiment of the invention;

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FIGURE 2 shows the hitch of Figure 1 being unlocked from an implement;

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FIGURES 3 and 4 are partial cross-sectional views from above showing an over-centre locking mechanism in the locked and unlocked positions respectively;

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FIGURES 7 and 8 show side elevations of a second embodiment of the invention, having a sliding ram locking means;

FIGURE 9 shows a hydraulic control circuit for use with the hitch;

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FIGURE 10 is a side elevation of a third embodiment of a hitch of the invention having a rotatable cam locking means;

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FIGURE 11 is a longitudinal cross-sectional view of one of the links of the hitch of Figure 10;

FIGURE 12 is a schematic elevation of a fourth embodiment of a hitch of the invention having a locking

pin;

FIGURE 13 is a schematic elevation of a fifth embodiment of a hitch of the invention having a sliding
5 tongue locking means; and

FIGURE 14 is a schematic elevation of a sixth general embodiment of a hitch of the invention wherein the jaws are arranged to engage the implement pins
10 from the outside.

A hitch embodying the invention is illustrated attached to an excavator arm comprising a dipper 1, a tipping link 2 and a pair of crowd links 3 in conventional manner. A hydraulic cylinder (not shown) acts
15 on a rod 4 for tipping the implement towards the position shown in Figure 2.

Figures 1 to 6 show a hitch 5 according to a first embodiment of the invention. The hitch 5 is
20 shown generally in Figures 1 and 2 (from which some details are omitted) and in more detail in Figures 3 to 6. The hitch is attached by means of pivot pins 6, 7 to the tipping link 2 and dipper 1, respectively, of the excavator. Numerals 8 and 9
25 indicate a pair of parallel spaced pins provided on the implement e.g. a bucket.

The hitch 5 comprises an outer link 10 and an
30 inner link 11. The links 10, 11 are pivotally connected, at one end to form a central pivot point and their free ends are provided with respective jaws 12, 13 for embracing the implement pins 8, 9 respectively. The links are locked over-centre (with respect to the
35 pivot pins 6 and 7) when a beak 14 provided on the outer link 10 abuts a stop 15 on inner link 11.

The over-centre locking mechanism is shown in more detail in Figures 3 to 6. A hydraulic motor 16 is bolted to the inner link 11 and carries an eccentric shaft 17 which extends freely through an aperture 18 in the inner link. The eccentric shaft 17 is bushed into a circular bushing 19 in the outer link 10.

An arm 20 is fixed to the end of shaft 17 and co-operates with a projection 21 on the outer link 10 for throwing the mechanism over-centre for disengagement.

The hitch 5 may be operated as follows. The excavator arm is brought down to the position shown in Figure 2 with the implement attached and the over-centre locking mechanism in the position shown in Figures 3 and 5. The hydraulic motor 16 is then operated so as to rotate the shaft 17 in an anti-clockwise direction from the position shown in Figure 5. The shaft 17 is eccentrically mounted and for rotation about the axis of rotation shown in dotted lines, causes retraction of the outer link 10 longitudinally towards the inner link 11, reducing the distance between the jaws 12 and 13. This partially releases the implement pins 8, 9. Further anti-clockwise rotation of shaft 17 causes the end of the arm to abut against the projection 21, thereby throwing the locking mechanism over-centre and causing links 10 and 11 to jack-knife to the position shown in Figures 4 and 6. In this position the jaws 12, 13 are fully detached from implement pins 8, 9 and the excavator arm can be moved to pick-up a fresh implement.

When the hitch 5 has been aligned above a fresh implement, hydraulic motor 16 is reversed and shaft 17 rotated in a clockwise direction. This allows the links 10, 11 to straighten from the position shown in Figures 4 and 6 over-centre until the beak 14 rests

against the stop 15, due to the weight of the links and the hydraulic motor. There after further clockwise rotation of the shaft 17 extends the outer link 10 relative to the inner link 11, thus allowing for any
5 variations in spacing of the implement pins 8, 9.

In the above described embodiment, the links are moved over-centre (with respect to the pivots 6 and 7) under the effect of gravity. In another
10 embodiment of the invention the links may be positively moved over-centre by the provision of a further protrusion 22 shown in dotted lines in Figure 6. In this case the bushing 19 is elongated as shown in dotted lines. For engagement of the hitch, the eccentric
15 shaft 17 is rotated clockwise until the arm 20 strikes protrusion 22, which throws the mechanism over-centre. On further rotation, the elongated bush 19 allows the arm 20 to ride over the pin 22 and to continue extension of the links until the implement pins 8, 9 are firmly
20 engaged. Other arrangements for allowing the arm 20 to ride over the pin 22 may also be envisaged, such as by allowing the arm 20 to slide longitudinally across the end of shaft 17 once the mechanism has been thrown over-centre.

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The eccentric mounting of shaft 17 allows for a certain degree of longitudinal movement of the links 10, 11 relative to one another (usually about 20 to 30mm). In order to allow the hitch to cope with
30 variations in implement pin spacing in excess of this, provision may be made for sliding the motor 16 longitudinally relative to the inner link 11, for example by unbolting the motor, or by rotating the motor in an eccentric arrangement mounted on the inner link 11.

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In order to operate the hitch, the motor 16 need not rotate more than 180°. It is therefore possible

to replace the motor by means of a ram acting on an arm extending transversely of the shaft 17. The hydraulic motor might also be replaced by an electric motor.

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Figures 7 and 8 show a second embodiment of the invention wherein a hitch 50 comprises an outer link 30 and an inner link 31 having respective jaws 32 and 33 for embracing implement pins 8, 9. The links are
10 pivotally connected at 34 and there is no provision for longitudinal movement of the links relative to one another. The outer link 30 is provided with a nose 35 having a ramp surface. A cylinder 37 is attached to the inner link 31 and operates a ram 36 having a
15 further ramp surface abutting nose 35.

The hitch 50 may be operated as follows: with the hitch 50 in the jack-knifed position, shown in dotted lines in Figure 8, the links are positioned
20 over implement pins 8, 9. The links are then allowed to fall over-centre (with respect to pivot pins 6, 7) by gravity until the jaws 32 and 33 embrace the implement pins 8, 9 respectively. The cylinder 37 is then operated to extend the ram 36, thereby bearing against the nose 35
25 and pushing the hitch further over-centre until the jaws firmly engage the implement pins 8, 9. For removal, the ram 36 is retracted and the excavator arm is lifted so as to jack-knife links 1 and 2 and thus allow the implement to be released.

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Figure 9 shows a hydraulic control circuit for use with the embodiments described previously. The excavator is provided with a tipping cylinder 40 having a ram 4, and hydraulic inlet and outlet lines 41, 42
35 respectively, for hydraulic fluid. Parallel lines 43, 44 lead to hydraulic means 45 (e.g. motor or cylinder) whose direction of operation is controlled by a reversing

solenoid control valve 46. Non return valves 47, 48 are provided in lines 43, 44 respectively. With this arrangement, if leakage occurs, the double non-return valve arrangement will stop the hitch hydraulic means from becoming depressurised. In normal operation, an increased pressure in the tipping cylinder 40 (such as encountered during digging) causes a simultaneous pressure increase in the hydraulic means 45 tending to maintain the hitch jaws firmly closed. This provides additional protection against accidental detachment of the implement.

Figures 10 and 11 show a third embodiment having a rotatable cam locking means. This comprises an inner link 50 and outer link 51 pivotally connected by a pivot 52. The links have respective attachment points 53 and 54 for pivotal attachment to the dipper and tipping link of an excavator, and respective jaws 55 and 56 for engaging the implement pins.

20

As shown more clearly in Figure 11 the outer link 51 comprises a pair of spaced upper flanges 57 and a pair of spaced lower flanges 58 interconnected by a plate 59 and a bar 60. The jaw 56 consists of a part cylindrical channel element extending transversely of the hitch. Similarly, the inner link 50 comprises a pair of interconnected upper and lower flanges 61 and 62 respectively.

The locking means comprises a nose 63 formed as an extension of the lower flange 58, and which overlaps lower flange 62. Each lower flange 58 has a ramp surface 64 which is engaged by a rotatable cam 65 mounted on each upper flange 61. The cam is rotatable by a hydraulic motor (not shown). Rotation of the cam in engagement with the ramp surface 64 pivots the links and moves the jaws 55, 56 apart until they firmly

engage the implement pins. The hydraulic motor may then be deactivated without danger of the hitch becoming disengaged from the implement.

5 Figure 12 is a schematic view of a fourth embodiment of a hitch which is generally similar to the previous embodiments but which employs transversely slidable locking pins 70 as the locking means. A pair of locking pins are slidable in apertures in the inner
10 links 72 by a hydraulic cylinder (not shown). When the hitch is engaged, the pins are slid out into corresponding apertures 71 in outer links 73 to lock the links together.

15 Figure 13 is a schematic view of a fifth embodiment of a hitch which uses a sliding tongue locking means. The sliding tongue 80 is operated by a hydraulic cylinder (not shown) mounted on an outer link 81. The tongue engages under a transverse rod 82 on an inner link 83
20 to lock the links together.

 Figure 14 is a schematic view of a sixth embodiment of a hitch having inward facing jaws 90 and 91 on outer and inner links 92, 93 respectively, for embracing
25 implement pins from the outside thereof. In the engaged position, the pivot 94 of the links is over-centre both with regard to the implement pins and to attachment points 95 and 96 of the dipper and tipping link. Additional locking means as described above may also
30 be provided if necessary.

 The features disclosed in the foregoing description, in the following claims and/or in the accompanying drawings may, both separately and in any
35 combination thereof, be material for realising the invention in diverse forms thereof.

CLAIMS:

1. A quick-release hitch for attachment to the arm of an excavator, the hitch being adapted to pick up and retain an implement provided with a pair of spaced apart pins; which hitch comprises: a first and a second
5 longitudinally extending link, first ends of the links being pivotally connected together and a second free end of each link having a jaw for embracing a respective implement pin, locking means for locking the links together against relative pivotal movement when an
10 implement has been engaged by the hitch; and attachment means for attaching the hitch to the excavator arm.
2. A hitch according to Claim 1, wherein the locking means comprises an over-centre mechanism, in which
15 said pivotal connection of the links may be pivoted to an engaged position which is over-centre with respect to a line joining spaced attachment points of the attachment means; the attachment points being adapted, respectively to, attach the hitch to a dipper and a
20 tipping link of the excavator arm.
3. A hitch according to Claim 1, wherein the locking means comprises an over-centre mechanism, in which
25 said pivotal connection of the links may be pivoted to an engaged position which is over-centre with respect to a line joining the jaws of the hitch.
4. A hitch according to any one of Claims 1 to 3, wherein the locking means comprises a rotatable cam
30 element mounted on one link which engages a ramp surface provided on the other link, thereby allowing locking together of the links in a range of pivotal positions with respect to each other.
- 35 5. A hitch according to any one of Claims 1 to 3,

wherein the locking means comprises a transversely slidable locking pin passing through apertures in the links.

5 6. A hitch according to any one of Claims 1 to 3, wherein the locking means comprises a sliding tongue provided on one link and slidable into engagement with the other link.

10 7. A hitch according to any one of the preceding claims, comprising a remotely operable drive means connected to the locking means for operation thereof.

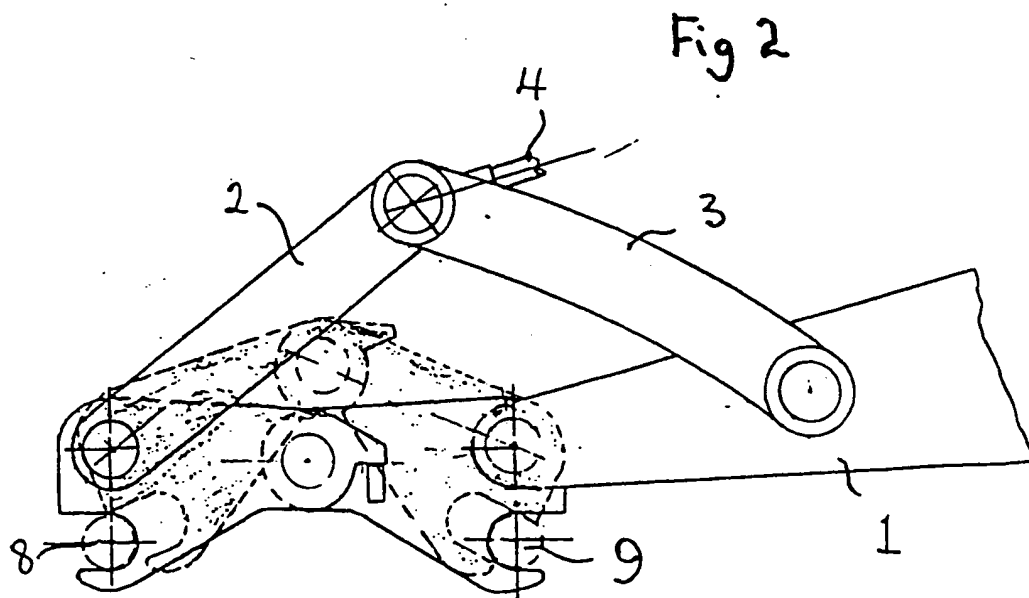
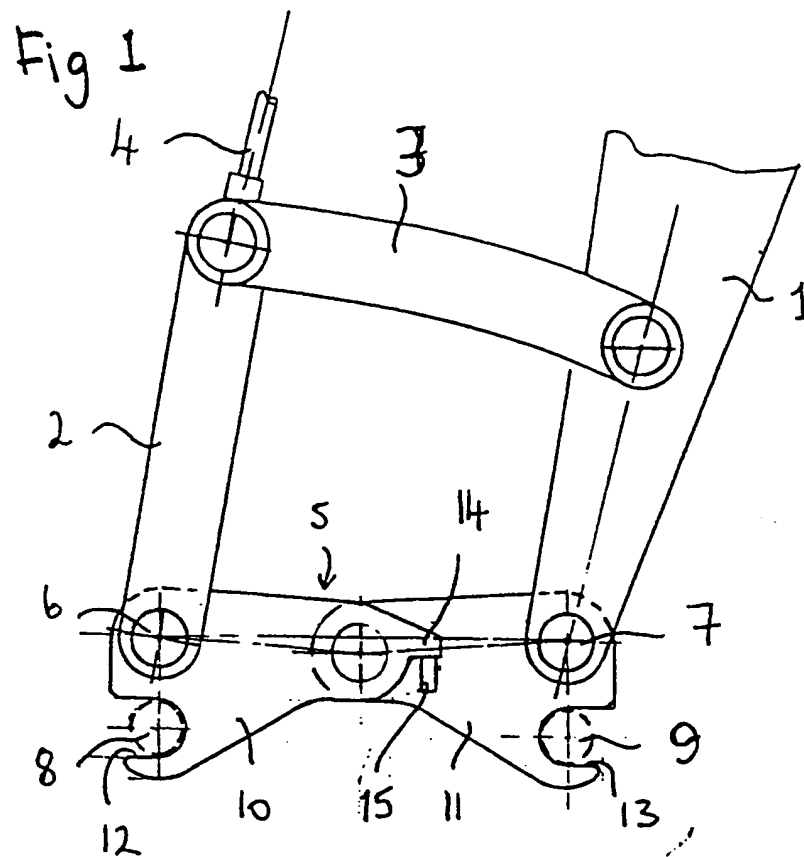
15 8. A hitch according to any one of the preceding claims, which further comprises means for sliding the links longitudinally relative to one another, so as to vary the longitudinal spacing of the jaws.

20 9. A hitch according to Claim 8, wherein said means for sliding comprises an eccentrically mounted shaft on one link, the shaft which is journaled into the other link.

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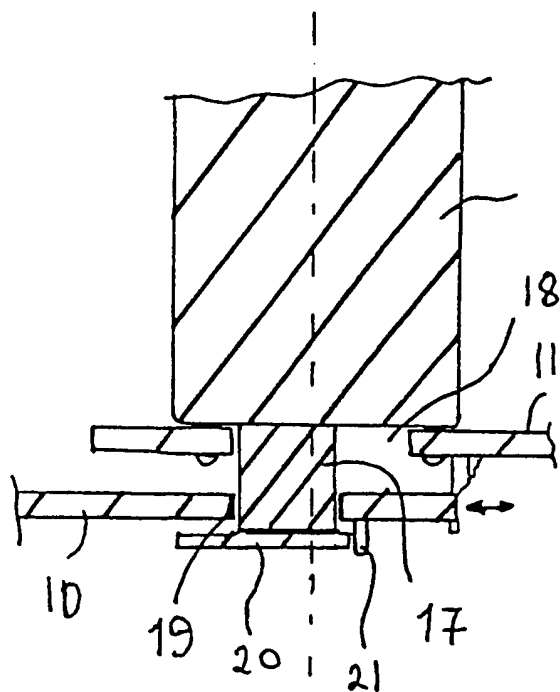


Fig 3

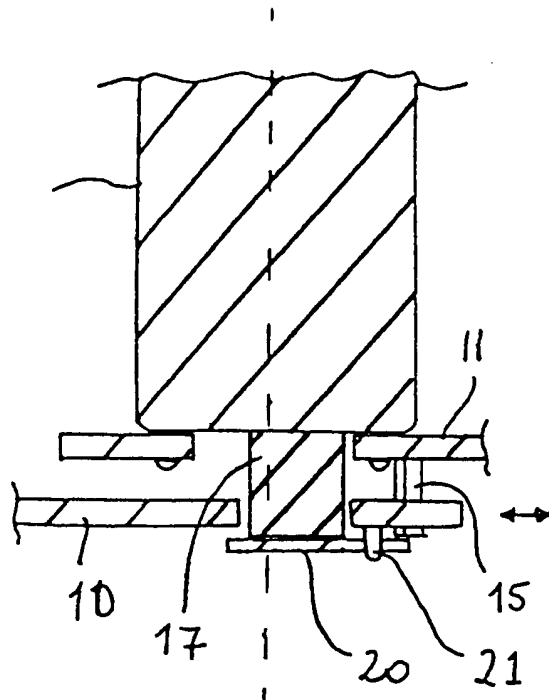


Fig 4

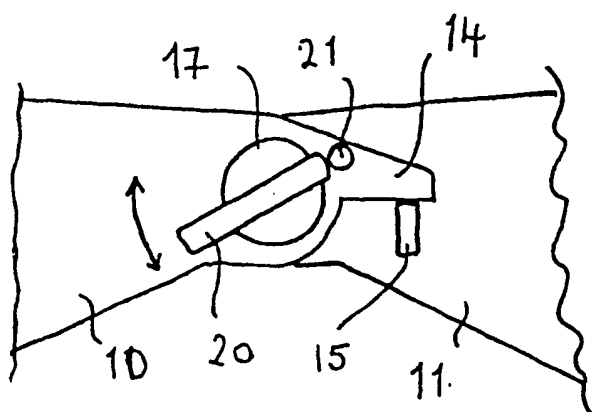


Fig 5

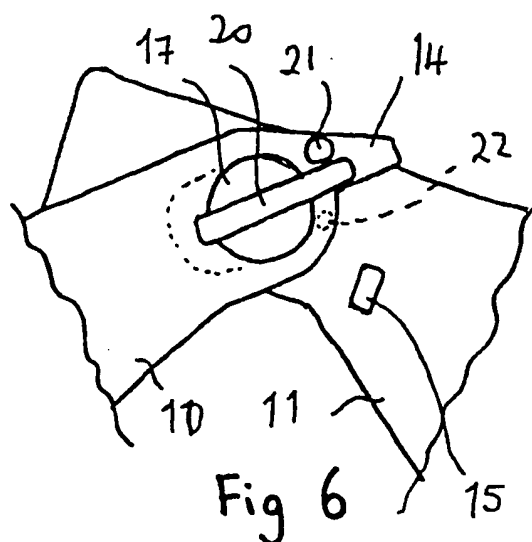


Fig 6

Fig 7

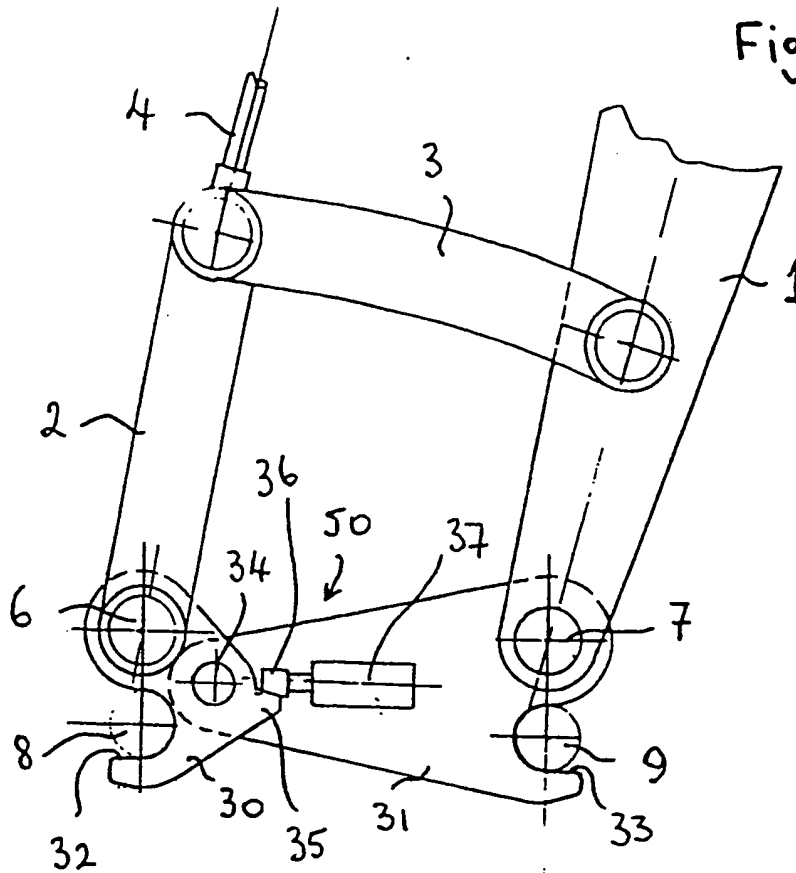


Fig 8

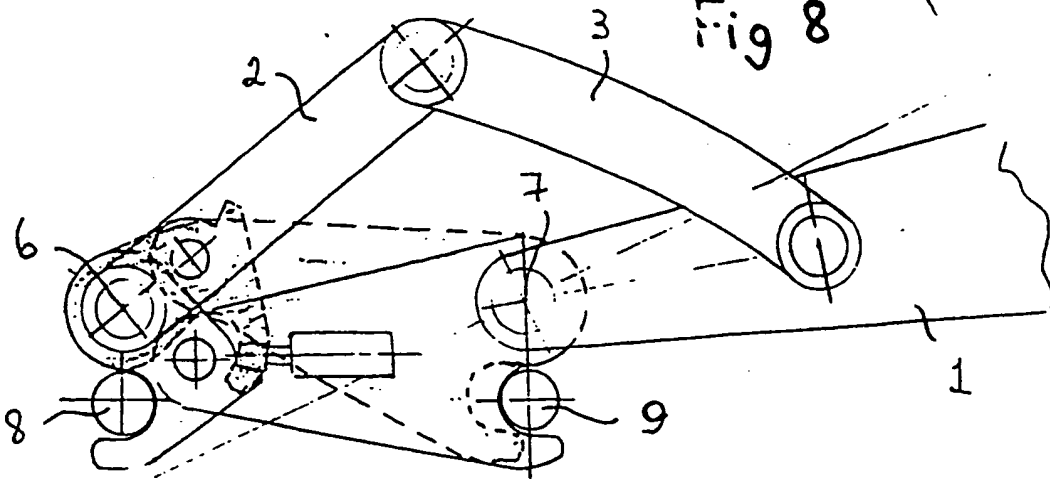
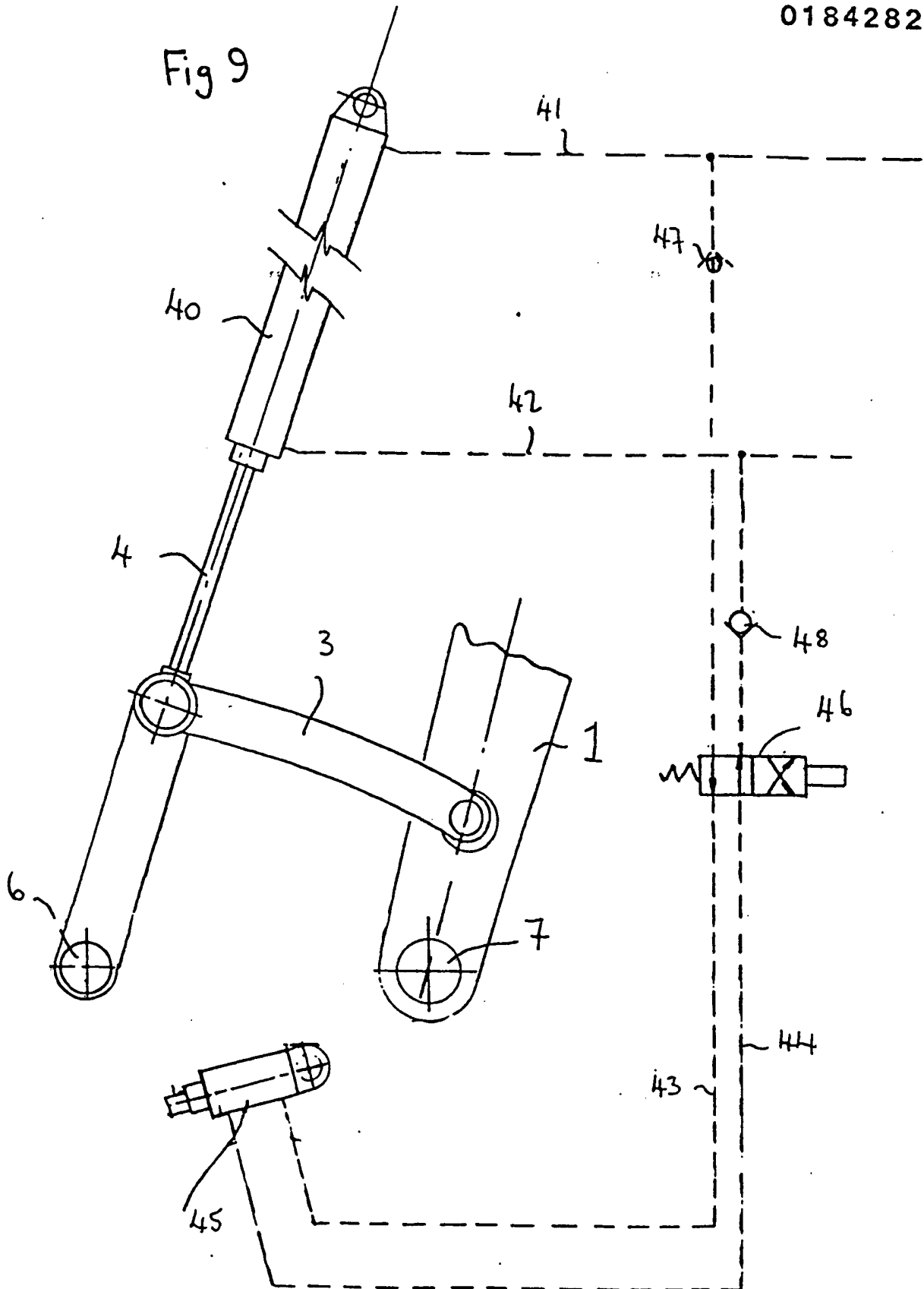


Fig 9



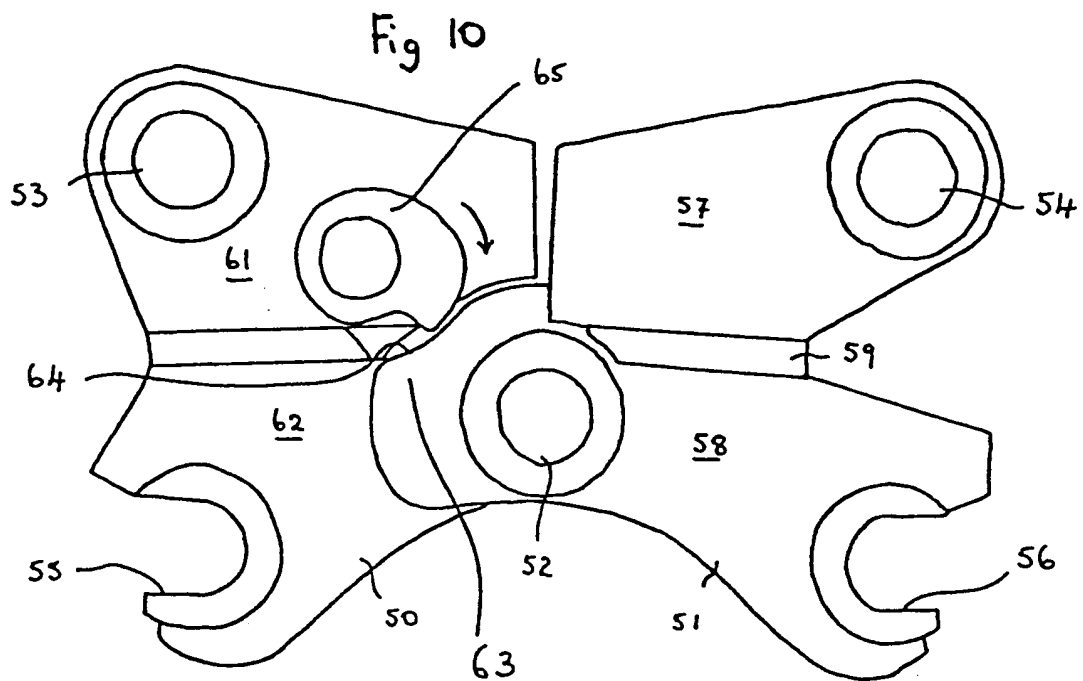


Fig 11

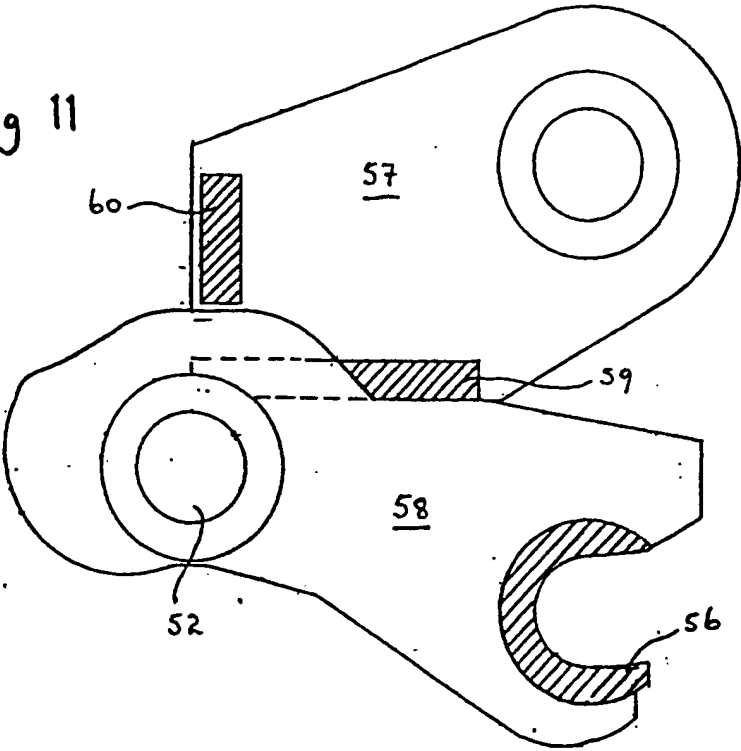


Fig 12

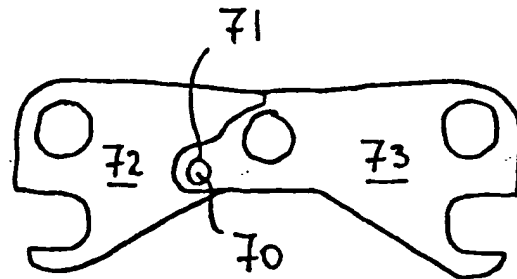


Fig 13

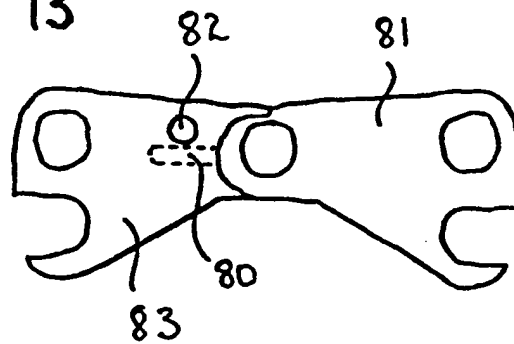
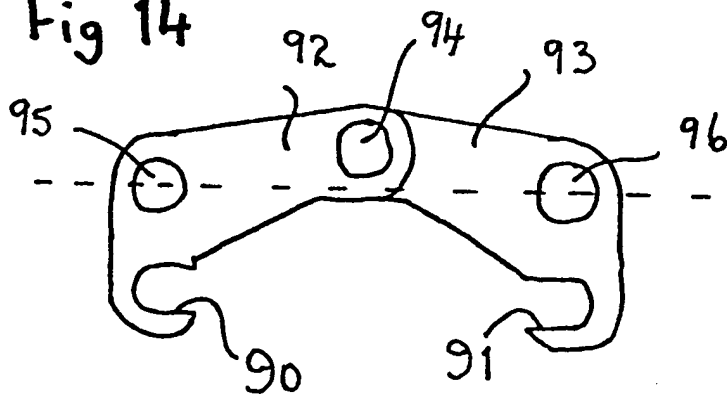


Fig 14





European Patent
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EUROPEAN SEARCH REPORT

0184282

Application number

EP 85 30 4746

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	GB-A-2 053 142 (M.T. BRAML) * Claims 1-11; figures 1-7 *	1, 4, 6, 8	E 02 F 3/40 E 02 F 3/627
A	---	2, 3	
A	US-A-4 116 347 (UCHIDA) * Abstract; figures 1-9 *	1-3, 8	
A	--- US-A-4 116 346 (UCHIDA) * Abstract; figures 1-9 *	1, 7	
A	--- FR-A-2 377 486 (CATERPILLAR TRACTOR CO.) * Figures 1-3 *	1, 7	
A	--- DE-A-2 734 972 (H. BANGERT) * Claims 1-3; figures 1, 2 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 4) E 02 F
A	--- US-A-3 985 249 (L.E. AKER et al.) * Abstract *	1	

The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20-01-1986	Examiner ANGIUS P.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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